FOCUS

Reporting on innovative products and strategies for building better, safer roads • **June 2000**

The Right Road at the Right Time: Video Offers Keys to Preventive Maintenance Success

For highway agencies, times are changing. "It's no longer about constructing roads," says Jim Sorenson of the Federal Highway Administration (FHWA). "It's about preserving and maintaining the existing roads." And for an increasing number of States, preserving those roads means using preventive maintenance techniques. Instead of waiting until a road has significantly deteriorated before rehabilitating it, preventive maintenance involves applying carefully timed, cost-effective treatments to roads experiencing only light to moderate distress. These treatments help retard pavement deterioration, improve the function/condition of the highway system, and can extend the life of a structurally sound pavement by 5 to 10 years.

In order to assist highway agency managers in using preventive maintenance techniques, FHWA, the Foundation for Pavement Preservation, and the American Association of State Highway and Transportation Officials (AASHTO) Lead States Team for Pavement Preservation have prepared a new videotape, *Preventive Maintenance: Project Selection.* The video is a follow-up to an earlier FHWA release, *Protecting Our Pavements: PREVENTIVE Maintenance,* which was aimed at upper-level management. The new video is geared more toward the maintenance supervisors and program managers who make the daily decisions to implement various preventive maintenance treatments.

The video takes an in-depth look at the project selection process, highlighting the key factors for achieving optimum results with preventive maintenance. It recommends that highway agencies take the following steps:

- **Select the right road**—Evaluate road conditions in order to determine which roads are good candidates for preventive maintenance. In evaluating a road, an agency should measure such factors as distress (cracking), ride quality (roughness), pavement deformation or faulting, and friction. An agency should also look at climate/environmental conditions and whether the road has a high or low volume of traffic. The best candidates for preventive maintenance are roads that are still structurally sound and are experiencing a slow to normal rate of deterioration.
- **Select the right treatment**—Agencies need to be familiar with a number of

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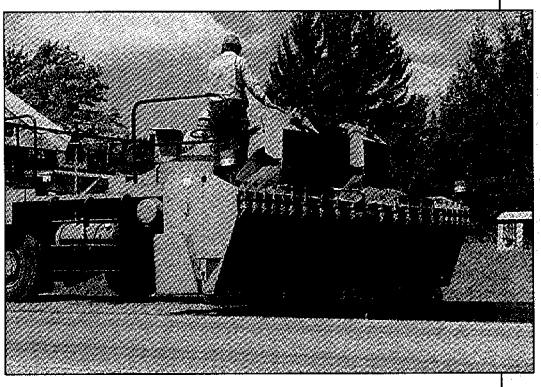

Between 1992 and 1996, preventive maintenance treatments, such as the chip sealing shown here, saved Michigan DOT an estimated $700 million.

Inside...

U.S. Department of Transportation

Federal Highway Administration

The Concrete Pavement Technology Program: Creating a New Generation of Concrete Pavements

With research projects investigating everything from building pavements that can better stand up to heavy traffic loads to making more cost-effective design choices, the Concrete Pavement Technology Program is changing the face of concrete pavement design and construction.

Launched in 1999, the program is a 5-year, $25 million effort that was charged by the Transportation Equity Act for the 21st Century (TEA-21) with carrying out "research on improved methods of using concrete pavement in the construction, reconstruction, and repair of Federal-aid highways." The program is being jointly administered by the Federal Highway Administration (FHWA) and the Innovative Pavement Research Foundation (IPRF), a concrete paving industry consortium. The program's partners also include State highway agencies and the Transportation Research Board (TRB). "Our ultimate goal is to create a new generation of concrete pavements," says Bob Betsold, Executive Director of the IPRF.

Seven research projects were initiated as part of the program in 1999:

- Traffic Management Studies for Reconstructing High-Volume Roadways
- Impact of Texturing and Surface Treatment on Reducing Wet-Weather Accidents
- Performance and Design of Whitetopping Overlays for Heavily-Trafficked Pavements
- Tests or Standards to Identify Compatible Combinations of Individually Acceptable Concrete Materials
- Accelerated Loading Tests of Ultra-Thin Whitetopping (UTW)
- Costs and Benefits of Various Components of Concrete Pavements
- Field Trials of Concrete Pavement Product and Process Technology

The projects have the overall goals of reducing user delays, reducing costs, improving performance, and fostering innovation. The traffic management studies, for example, aim to implement pilot projects on urban highways to demonstrate reconstruction work that causes minimal user disruption. The costs and benefits study has the goal of providing States with specific recommendations on how they can revise their design standards so that they are more cost-effective.

The program added six new projects this year:

- Performance and Design of Separated (Unbonded) Concrete Overlays
- Influence of Sealing Transverse Contraction Joints on the Overall Performance of Concrete Pavement
- Revision of I-Slab 2000 for Subbase/Pavement Interaction
- Workshop on Concrete Pavement Technology for State DOT Pavement Engineers
- Develop a Plan to Investigate the Impacts of Pavement Cracking on Long-Term Performance
- Determine Actual Life-Cycle Costs

As with the first seven projects, these initiatives aim to provide multiple benefits to States, contractors, and highway users. The transverse joint sealing project, for example, is looking at whether the use of narrow, unsealed joints on short jointed concrete pavements can provide long-term pavement performance equal to that of sealed joints. If so, States could save millions of dollars in construction and maintenance costs and highway users could see reduced traffic delays, as lanes would not have to be closed for sealant maintenance.

In addition to the oversight provided by FHWA and the IPRF, the program receives guidance from the TRB Committee for Research on Improved Concrete Pavements. The committee reviews and advises on the program's long-range work plan and project tasks, including objectives and appropriateness and likelihood of success. Chaired by Joe Denault of the West Virginia Department of Transportation, the committee has representatives from industry, academia, and other State highway agencies, as well as liaisons from FHWA, IPRF, and the American Association of State Highway and Transportation Officials.

For more information on the Concrete Pavement Technology Program, contact Bob Betsold at IPRF, 703-288-8564 (fax: 703-288-8566; email: rbetsold @erols.com).

The future of concrete pavements will be further explored in a new long-term technology plan being developed by FHWA, IPRF, and the TRB Committee for Research on Improved Concrete Pavements. This document will chart the course for future research, development, and educational activities. The plan will also cover funding goals for the next reauthorization of the Federal-aid highway program. A draft plan is expected to be available for review during the International Concrete Pavement Conference in Orlando, Florida, in September 2001.

Workshop Provides SPS Progress Report

At the long-term pavement performance (LTPP) Specific Pavements Studies (SPS) Workshop, held April 27–28 in Newport, Rhode Island, nearly 150 participants gathered to discuss the status of the SPS-1, -2, -5, and –6 experiments. These experiments were designed to learn how climate and cumulative traffic loading affect pavements of different compositions and layer thicknesses. The data from the projects, said Aramis Lopez of the Federal Highway Administration (FHWA), will help form "LTPP's lasting legacy," while contributing to "the best pavement database ever assembled."

Michael Darter of ERES/ARA Consultants gave a presentation on the state of the SPS-2 (structural factors for rigid pavements) data collection activities. The experiment is focused on jointed plain concrete, examining such factors as the effect of temperature, moisture, subgrade type, and slab thickness and widening on pavement performance. Darter noted that data collection has been good overall, with 82 percent of all targeted data types represented in the LTPP database. This data will have a variety of applications, including use in benefit/cost analyses and for empirical pavement modeling.

Recommendations for the future include measuring layer thickness within test sections. It was also suggested that data be collected in some new areas, including conducting video surveys of edge drains to make sure that they are working correctly.

The goals of the SPS-1 (structural factors for flexible pavements) experiment include learning the structural benefits of different base types and thicknesses. As summarized by Harold Von Quintus of Fugro/BRE, most of the projects are performing well. The States with SPS-1 sites represented at the workshop, including Arizona, Texas, Arkansas, and Florida, made the suggestion that forensic testing be done on sections scheduled for rehabilitation or reconstruction, in order to learn more about why they failed.

Eighteen SPS-5 (rehabilitated asphalt concrete pavements) sites have been built, containing a total of 210 core test sections and 48 supplemental ones. The goals of the experiment include calibrating and validating pavement overlay and rehabilitation design methods. The experiment's strengths include its coverage of a wide range of climates and hot-mix asphalt mixtures, as well as the fact that only seven of the core test sections have had to be taken out of service because of failure. However, many sections with 7 or more years of service have begun to show signs of significant fatigue cracking. Von Quintus rated the overall health of the experiment as "good to excellent. I think this experiment will be very, very important, both now and into the future."

States participating in the SPS–6 (rehabilitation of jointed portland cement concrete pavements) experiment commented on their goals for the project. "We'd like a technique for designing for climatic conditions—something that we can count on lasting," said Gary Mann of the California Department of Transportation (DOT). Dave Ooten of Oklahoma DOT noted that the ultimate objective is to achieve better designs and save money. "Pavement designers want information to use when considering various design alternatives," he said.

Preliminary findings of the SPS-6 experiments include Illinois DOT's report that adding asphalt concrete overlays to their jointed portland cement concrete pavements increased pavement smoothness, while Oklahoma DOT

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Preventive Maintenance,
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treatments and applications, such as crack and joint sealing, surface seals (including chip seals, slurry seals, and micro-surfacing), and overlays, in order to apply the right preventive maintenance technique to the right roads.

- Act quickly—There is usually only a brief window of time during which preventive maintenance treatments can be applied and be cost-effective and worthwhile. Agencies must identify what needs to be done at a site and turn the job around quickly.

"Preventive maintenance is now an integral part of Michigan's highway program," says Larry Galehouse of the Michigan Department of Transportation (DOT), who is featured in the video. "We will never go back to not doing it." Between 1992 and 1996, preventive maintenance treatments saved Michigan an estimated $700 million.

To obtain a copy of the video, contact your local FHWA division office or the Foundation for Pavement Preservation at 202-367-1167 (fax: 202-367-2166; email: fpp@dc.sba.com). Copies can also be obtained from the International Slurry Surfacing Association, Asphalt Emulsion Manufacturers Association, and Asphalt Recycling & Reclaiming Association. These organizations can be reached at 410-267-0023 (fax: 410-267-7546; email: krissoff @compuserve.com). For more information on the video, contact Jim Sorenson at FHWA, 202-366-1333 (fax: 202-366-9981; email: james.sorenson @fhwa.dot.gov), or Larry Galehouse at Michigan DOT, 517-322-3315 (fax: 517-322-3385; email: galehouse@mdot.state.mi.us.). ▽

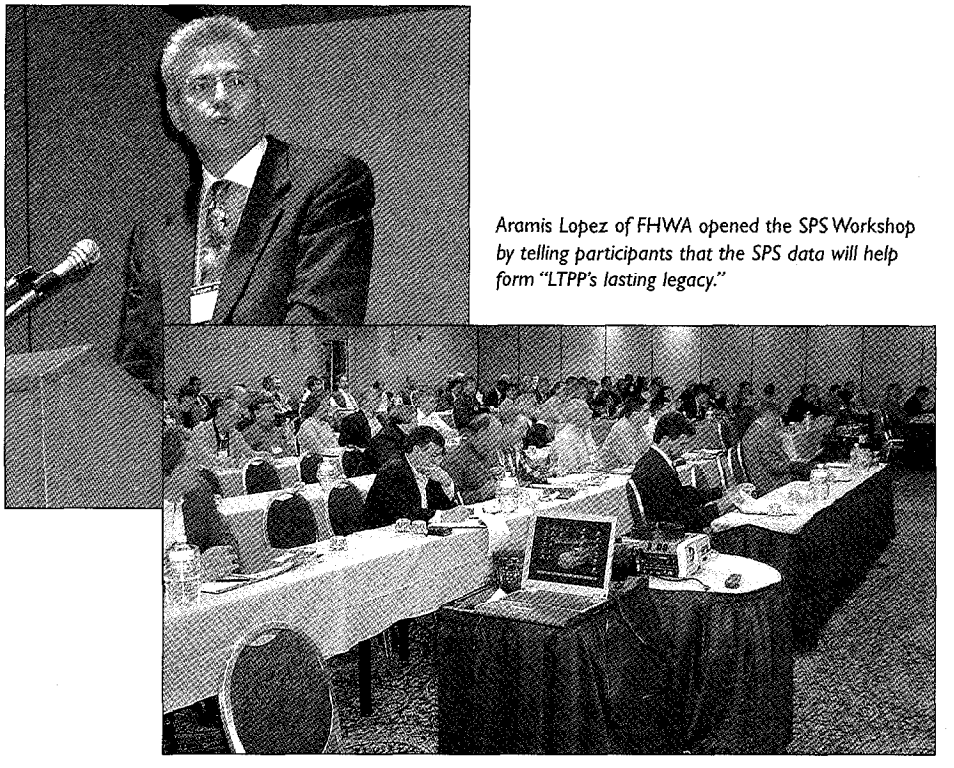
SPS Workshop,
continued from page 3

noted that it has not seen any noticeable benefit from installing edge drains in pavements. Oklahoma also reported that their test sections containing 20-cm (8-in) rubblized pavement with an asphalt overlay have performed very well, experiencing only minimal distress.

An added benefit to the SPS research is that highway agencies are already taking the results from their test sites and applying them in their own States. For example, the practice of rubblizing is receiving more consideration in Oklahoma, thanks to the State's SPS sections. The SPS results have also provided Oklahoma DOT with leverage for doing more research on a State-wide level. And in Missouri, the DOT has contracted with ERES/ARA Consultants to analyze the data from its SPS experiments and help determine how the results can be used to build better roads.

In the closing session of the workshop, Charlie Churilla of FHWA told participants that "we've done something that this country's highway community has never done before, and we've done it exceptionally well." Over the course of the experiments, he said, "we've continually made refinements and adjustments to make sure LTPP stays on target." As was noted in many of the workshop sessions, the biggest adjustment to make now to ensure that the experiments stay on target is to improve traffic data collection and materials testing for the SPS sites. A Traffic Expert Task Group (ETG) has been set up to look at various solutions to this problem, including implementing a State pooled-fund study.

For more information on the SPS experiments or the work of the Traffic ETG, contact Aramis Lopez at FHWA, 202-493-3145 (fax: 202-493-3161; email: aramis.lopez@fhwa.dot.gov).



Aramis Lopez of FHWA opened the SPS Workshop by telling participants that the SPS data will help form "LTPP's lasting legacy."

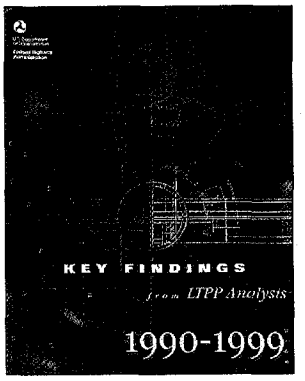
LTPP DATA AND THE 2002 DESIGN GUIDE

A new brochure compiled by the long-term pavement performance (LTPP) program looks at the role the LTPP data will play in the development of the *2002 Guide for the Design of New and Rehabilitated Pavement Structures*, which is currently being developed by the National Cooperative Highway Research Program. The 1993 American Association of State Highway and Transportation Officials *Guide for the Design of Pavement Structures* is widely used to design new and rehabilitated pavements. However, because the guide uses empirically-based procedures derived from test data not representative of current pavement design conditions, it is often inadequate for the design challenges currently faced by highway agencies.

Data gathered and analyzed by the LTPP program will help address many of the limitations of the current design guide. For example, the LTPP database contains performance data on rehabilitated pavements and covers all climatic conditions in the United States, while the American Association of State Highway Officials (AASHO) road test that the current guide is based on was conducted at only one geographic location and did not examine performance data for rehabilitated pavements. And the LTPP test sections cover a wide range of subgrade materials, in contrast to the one type of subgrade used for all the pavement sections in the AASHO road test. The LTPP data will also prove useful in calibrating distress prediction models for fatigue cracking, transverse cracking, and rutting in asphalt pavements and for joint faulting and transverse cracking in portland cement concrete pavements.

To obtain a copy of *LTPP and the 2002 Pavement Design Guide* (Publication No. FHWA-RD-00-129), contact Mary Tayor-Mattox at FHWA, 202-493-3155 (email: mary.taylor-mattox@fhwa.dot.gov). The brochure can also be found on the Web at www.tfhrc.gov/pavement/ltpp/brochure.htm.

LTPP Key Findings Point the Way toward Better Pavements



Since the long-term pavement performance (LTPP) program began more than a decade ago, it has sponsored research projects on critical issues ranging from the validation of pavement design procedures to pothole repair techniques. The results of this research, and its potential to improve future pavement technology, are covered in a new LTPP report, *Key Findings from LTPP Analysis 1990–1999* (Publication No. FHWA-RD-00-085).

The LTPP studies demonstrated the impact of site conditions, such as traffic, climate, subgrade, and geometrics, on pavement performance. For example, the effect of joint spacing on pavement performance varies significantly with climate. Colder and wetter climates allow longer joint spacing, while warmer and drier climates require a shorter joint spacing. For jointed plain concrete pavements, sealed joint sections performed better than unsealed sections, with the unsealed joints containing significantly more debris. Unsealed joints also had significantly more joint spalling.

The subgrade also plays an important role. Fine-grained soil subgrades show more joint faulting than coarse-grained subgrades, which is likely due to increased erosion and reduced bottom seepage of water. And jointed plain concrete pavements constructed on coarse-grained subgrades were smoother than those constructed on fine-grained subgrades. Thus, the placement of a thick layer of granular material beneath the base course may contribute to improved drainage and reduced faulting.

Such structural features as the width of a portland cement concrete pavement slab can also play a significant role in the pavement performance. Widening the slab reduces pavement faulting by reducing the critical deflection at the corner of the slab caused by heavy truck axles.

For continuously reinforced concrete pavements, the LTPP findings demonstrated that steel content is one of the most important factors in improving performance. The greater the percentage of reinforcing steel, the smoother the pavement. Pavements that performed well in the LTPP studies had steel contents ranging from 0.51 percent to 0.75 percent.

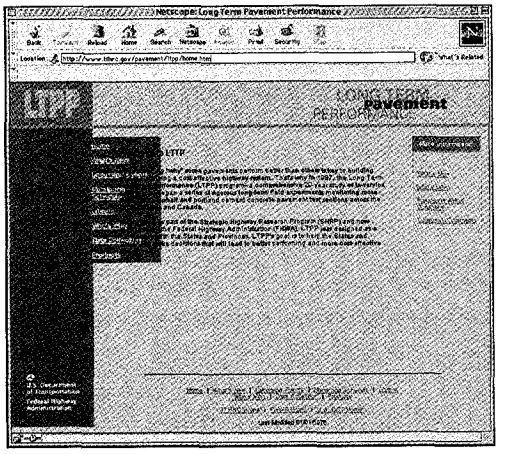
The LTPP studies also addressed pavement maintenance. In the area of pothole repair, the throw and roll technique proved to be just as effective as the more traditional cut, fill, and compact method, while offering lower labor and equipment costs. Repairs made with the spray-injection technique also performed well at most sites.

The LTPP data has not only been valuable by itself, but it has been used to evaluate and validate such items as the National Cooperative Highway Research Program rigid pavement design model.

To order a copy of the report, contact Mary Taylor-Mattox at FHWA, 202-493-3155 (email: mary.taylor-mattox@fhwa.dot.gov). The report can also be found on the LTPP Web site at www.tfhrc.gov/pavement/ltpp/key.htm. For more information, contact Cheryl Richter at FHWA, 202-493-3148 (fax: 202-493-3161; email: cheryl.richter@fhwa.dot.gov).

LTPP ONLINE

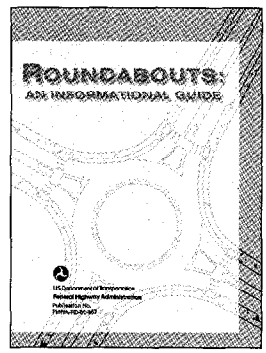
You can find out more about the products and publications of the LTPP program by checking out its Web site (www.tfhrc.gov/pavement/ltpp/home.htm). The site features updates on the LTPP data collection efforts; a library of brochures, reports, and other publications; a list of frequently asked questions about the LTPP program; and information on how to order such products as the rigid pavement design software. You can also link to the LTPP database site.



In Brief...

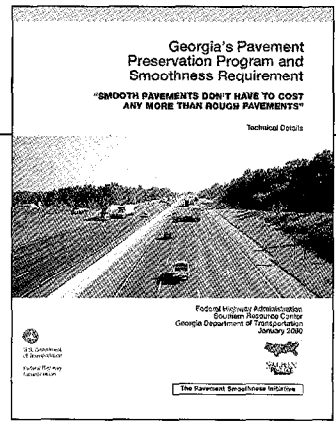
A new FHWA Web site on **subsurface utility engineering (SUE)** provides a basic introduction to how this process can help engineers obtain reliable information on underground utility locations when designing roads. The site includes information on how SUE works, the benefits of using the process, and how to select a SUE provider. The site also includes case studies on States that have successfully used SUE in their highway planning. To visit the Web site, go to www.fhwa.dot.gov/infrastructure/progadmin/sueindex.htm.

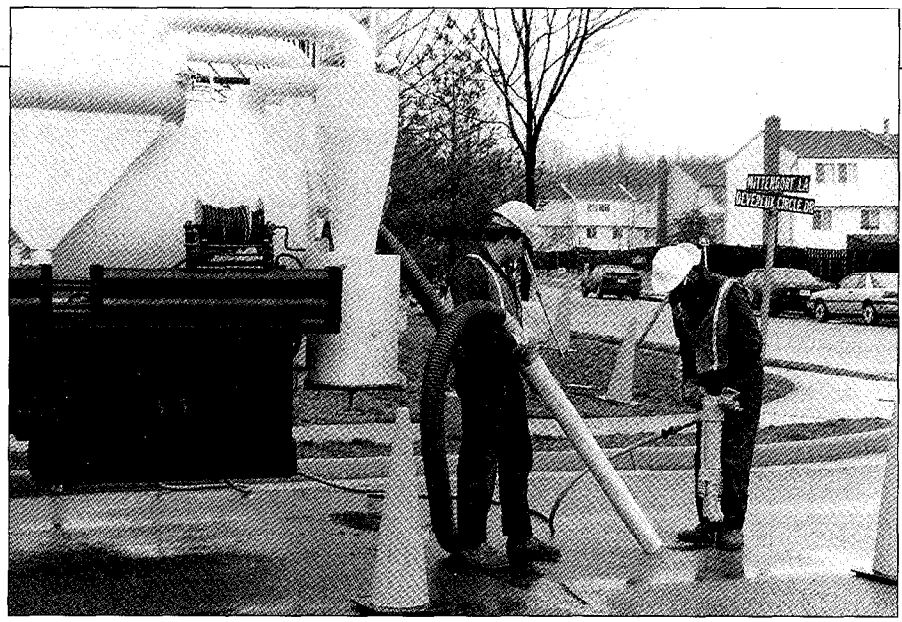
Roundabouts, a form of circular intersections with specific design features, are used throughout the world to control traffic. Until recently, however, many transportation agencies in the United States were hesitant to recommend and install roundabouts, due to a lack of nationwide guidelines on their planning, performance, and design. To facilitate the design and building of these intersections, the Federal Highway Administration (FHWA) has developed ***Roundabouts: An Informational Guide*** (Publication No. FHWA-RD-00-067). The guide provides information on planning techniques, evaluation procedures for assessing operational and safety performance, and design guidelines. It will be posted on FHWA's Turner-Fairbank Highway Research Center Web site (www.tfhrc.gov/safety/00068.htm) this month, while printed copies will be available in August. To order a free copy, contact the FHWA Research and Technology Report Center at 301-577-0818 (fax: 301-577-1421; email: marl.green@fhwa.dot.gov). For more information on roundabouts, contact Joe Bared at FHWA, 202-493-3314 (email: joe.bared@fhwa.dot.gov).



A new report issued by the Georgia Department of Transportation (DOT) details the State's **techniques and best practices for achieving smoother pavements.** These best practices include implementing a strict smoothness specification for new pavements and overlays. The DOT also does an annual survey of the condition of the entire State-maintained highway system. This survey provides Georgia with the data to identify pavement sections that need to be fixed before cracking, rutting, and other distresses become severe enough to require extensive rehabilitation or reconstruction.

The report can be found on the Web at www.fhwa.dot.gov/resourcecenters/southern/ga_pave.pdf. For more information, contact Luis Rodriguez at FHWA, 404-562-3681 (email: luis.rodriguez@fhwa.dot.gov).





The subsurface utility engineering process can help engineers obtain reliable information on underground utility locations when designing roads.

Highway Technology Calendar

The following events provide opportunities to learn more about Strategic Highway Research Program (SHRP) products and technologies, as well as other technologies for building better, safer roads.

U.S. Department of Transportation Environmental Justice Summit
July 17–18, 2000, Arlington, VA

Sponsored by the Federal Highway Administration and the Federal Transit Administration, the summit will bring together State departments of transportation, metropolitan planning organizations, transit providers, and members of local, community-based, and national advocacy organizations to discuss environmental justice issues relating to surface transportation programs and the Federal planning process.

Contact: Gina Burge at Harrington-Hughes and Associates, 202-347-5938 (fax: 202-347-6938; email: gburge@harrington-hughes.com).

Petersen Asphalt Research Conference
July 17–19, 2000, Laramie, WY

Sponsored by the Western Research Institute, the conference will feature presentations on such topics as the composition and reactivity of asphalt, low-temperature behavior of pavements, and asphalt-aggregate interactions. The conference will also feature displays by vendors.

Contact: Raymond Robertson at the Western Research Institute, 307-721-2249 (fax: 307-721-2300; email: redoxwri@uwyo.edu; Web: www.westernresearch.org/Projects/Parc/Index.htm).

International Symposium and Innovative Technology Tradeshow 2000: Moving Innovation into Practice for a Sustainable Future
August 14–17, 2000, Washington, DC

This symposium on the design and construction technology of the future will include a special track on transportation infrastructure and public works.

Contact: CERF, 202-842-0555 (fax: 202-789-2943; email: 2000@cerf.org; Web: www.cerf.org).

Fifth Annual Eastern Winter Road Maintenance Symposium and Equipment Expo
September 6–7, 2000, Roanoke, VA

The symposium and equipment expo will coincide with the Transportation Research Board's "Fifth International Symposium on Snow Removal and Ice Control Technology," which is scheduled for September 3–8, 2000.

Contact: Deborah Vocke at FHWA, 410-962-3744 (fax: 410-962-3655; email: deborah.vocke@fhwa.dot.gov).

Fifth Annual Lead States Workshop
September 17–19, 2000, St. Louis, MO

The final Lead States Workshop will provide an official wrap-up for members of the seven teams. The team members will also discuss their transition plans for shifting responsibilities to the appropriate AASHTO subcommittees.

Contact: Haleem Tahir at AASHTO, 301-975-5275 (fax: 301-330-1956; email: haleem.tahir@nist.gov).

International Symposium on High-Performance Concrete
September 25–27, 2000, Orlando, FL

The symposium will address the research, design, construction, performance, and benefits of high-performance concrete. It is being held in conjunction with the 46th annual Precast/Prestressed Concrete Institute Annual Convention and Exposition.

Contact: Terry Halkyard at FHWA, 202-366-6765 (fax: 202-366-3077; email: terry.halkyard@fhwa.dot.gov).

Asphalt Rubber 2000: The Pavement Material of the 21st Century
November 14–17, 2000, Vilamoura, Portugal

The conference will feature sessions on such topics as asphalt rubber binder design, pavement performance, and recycling.

Contact: Dick Stubstad at Consulpav, 805-649-1111 (fax: 805-649-2133; email: stubstad@aol.com; Web: www.consulpav.com/AR2000/).

Eighth Annual United States Hot-Mix Asphalt Conference
November 15–17, 2000, Cincinnati, OH

Sponsored by the National Asphalt Pavement Association (NAPA), State asphalt pavement associations, and the Asphalt Institute, the conference is designed for paving professionals in both the public and private sectors. This year's conference will focus on innovative contracting practices that provide incentives to build better pavements faster in order to increase customer satisfaction. Conference cosponsors include the Federal Highway Administration, American Association of State Highway and Transportation Offi-

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Highway Technology Calendar,
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cials, National Association of County Engineers, and Ohio Department of Transportation.

Contact: Carol Prouty at NAPA, 301-731-4748 (fax: 301-731-4621; email: carol@hotmix.org; Web: www.hotmix.org/2000hmaconf/index.htm).

Asphalt Technology 2000
December 10–13, 2000, Austin, TX

The conference is designed to provide a forum for transportation professionals and industry representatives to share information on practical engineering solutions to pavement problems. Topics covered will include specifications, pavement maintenance, and state-of-the-art technology.

Contact: Sharon Campos at the University of Texas at Austin, 512-471-3396 (fax: 512-471-0831; email: scampos@mail.utexas.edu).

Fourth Annual Asphalt Conference & Expo
March 11–14, 2001, Atlanta, GA

Conference topics will include work zone safety, quality control/quality assurance, choosing the right aggregate, and recycling and reclaiming. The conference will also feature outdoor repaving and reclamation demonstrations.

Contact: Wendy Cantwell at 816-246-7711 (fax: 816-254-7446). ▽

Send address corrections to Harrington-Hughes & Associates, Inc., 733 15th Street, NW, Suite 500, Washington, DC 20005; fax: 202-347-6938; email: gburge@harrington-hughes.com.

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Focus is a vehicle for promoting SHRP products and other highway technologies that FHWA and States are using to build better, safer roads. The Strategic Highway Research Program (SHRP) was established by Congress in 1987 as a 5-year, $150 million research program to improve the performance and durability of our Nation's highways and to make them safer for motorists and highway workers. As a follow-on to SHRP, Congress provided funding in the Intermodal Surface Transportation Efficiency Act of 1991 to implement SHRP products and to continue SHRP's long-term pavement performance (LTPP) program. While the 1998 Transportation Equity Act for the 21st Century did not specifically allocate any money for SHRP initiatives, FHWA remains committed to the continued implementation of SHRP products.

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